



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/516,380	11/30/2004	Toshiki Makimoto	14321.63	2860
22913	7590	10/30/2008		
Workman Nydegger 1000 Eagle Gate Tower 60 East South Temple Salt Lake City, UT 84111			EXAMINER NGUYEN, TRAM HOANG	
			ART UNIT	PAPER NUMBER
			2818	
			MAIL DATE	DELIVERY MODE
			10/30/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/516,380

Applicant(s)

MAKIMOTO ET AL.

Examiner

TRAM H. NGUYEN

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 50, 51, 53, 60, 77-82 and 84-98 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 50, 51, 53, 60, 77-82, 84-98 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/808)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/14/2008 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 50, 51,53,55,56,58,77-82,85-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Makimoto (US 2002/0195619; hereinafter Makimoto), and further in view of Bakowski et al. (US 6,313,488).

Regarding **claim 50**, Makimoto disclose a nitride semiconductor structure (fig. 10) comprising on a substrate (item 101):

an n-type collector layer (item 104);

a p-type base layer (refer to the lower half portion of 106) formed over said n-type collector layer (104), wherein said p-type base layer (106) is p-type InGaN;

an n-type emitter layer (107) formed directly on said p-type base layer (refer to the lower half portion of 106),

Makimoto fails to teach an indium-containing p-type nitride semiconductor layer formed directly on said p-type base layer so as to contact a top surface of said p-type base layer, wherein said indium-containing p-type nitride semiconductor layer does not contact said n-type emitter layer; and a base electrode regrown on the top surface; and a base electrode formed over said indium-containing p-type nitride semiconductor layer.

Fig. 3 of Bakowski shows a similar nitride semiconductor comprising: a p-type contact layer (11) formed directly on the p-type base layer (6) so as to contact a top surface of said p-type base layer (6), wherein said p-type contact layer (11) does not contact said n-type emitter layer (2); and a base electrode (5) formed over said p-type nitride semiconductor layer (11).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine Bakowski in the teaching of Makimoto so that the contact layer can act as an energy barrier for the electrons and diverting them towards the collector, which helps to obtain a low collect-emitter voltage in the on-state of the device (see Bakowski: col. 5, lines 50-52).

Although the Bakowski's contact layer 11 does not contain indium, the p-type contact layer 11 of Bakowski is made of the same material as the collector layer 6 (see col. 5, lines 35-36).

Makimoto teaches the collect layer 106 is a p-type InGaN, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine teaching of Makimoto and Bakowski to form a sub-layer in the collector layer which contains indium containing p-type nitride semiconductor layer as material of the collector layer so that the indium containing p-type nitride semiconductor layer can be act as the energy barrier for the nitride semiconductor device.

Regarding **claim 51**, Makimoto and Makimoto disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches said p-type nitride semiconductor layer (refer to the upper portion of p-type InGaN 106).

Regarding **claim 53**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teach said p-type InGaN base layer has an indium mole fraction of 5-30% (see fig. 10 exhibits the p-type InGaN base containing 6% of Indium).

Regarding **claim 55**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teach said p-type base layer is p-type InGa_N (see claim 52's rejection).

Regarding **claim 56**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teach said p-type InGa_N base layer has an indium mole fraction of 5-30% (see claim 53's rejection).

Regarding **claim 58**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teach said p-type InGa_N base layer has an indium mole fraction of 5-30% (see claim 53's rejection).

Regarding **claim 77**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set forth above. Furthermore, Fig. 10 of Makimoto shows a graded layer (105) between the p-type base layer (106) and the n-type collection layer (item 104); wherein the graded layer (106) has its indium mole fraction varied gradually (see par.[0009],lines 1-3).

Regarding **claim 78**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set forth above. Furthermore, Fig. 10 of Makimoto shows a graded layer (105) between the p-type base layer (106) and the n-type collection layer (item 104); wherein the graded layer (105) has its indium mole fraction varied gradually (see par.[0009],lines 1-3).

Regarding **claim 79**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set forth above. Furthermore, Fig. 10 of Makimoto shows a graded layer (105) between the p-type base layer (106) and the n-type collection layer (item 104); wherein the graded layer (105) has its indium mole fraction varied gradually (see par.[0009],lines 1-3).

Regarding **claim 80**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set forth above. Besides, fig. 10 of Makimoto shows the base electrode (109) is formed directly on said indium-containing p-type nitride semiconductor (refer to the upper portion of 16).

Regarding **claim 81**, Makimoto discloses a nitride semiconductor structure (fig. 10) comprising:

- an n-type collector layer (item 104);

- a p-type base layer (refer to the lower half portion of 106) formed over said n-type collector layer (104), wherein the p-type base layer (refer to the lower half portion of 106) has an etched top surface (refer to the exposed portion of the lower portion 106) and is p-type InGaN (106);

- an n-type emitter layer (107) formed directly on said p-type base layer (refer to the lower half portion 106);

Makimoto fails to teach an indium-containing p-type nitride semiconductor layer formed directly on the etched top surface of the p-type base layer, wherein said indium-containing p-type nitride semiconductor layer does not contact said n-type emitter layer;

and a base electrode regrown on the top surface; and a base electrode formed over said indium-containing p-type nitride semiconductor layer.

Fig. 3 of Bakowski shows a similar nitride semiconductor comprising: a p-type contact layer (11) formed directly on the p-type base layer (6) so as to contact a top surface of said p-type base layer (6), wherein said p-type contact layer (11) does not contact said n-type emitter layer (2); and a base electrode (5) formed over said p-type nitride semiconductor layer (11).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine Bakowski in the teaching of Makimoto so that the contact layer can act as an energy barrier for the electrons and diverting them towards the collector, which helps to obtain a low collect-emitter voltage in the on-state of the device (see Bakowski: col. 5, lines 50-52).

Although the Bakowski's contact layer 11 does not contain indium, the p-type contact layer 11 of Bakowski is made of the same material as the collector layer 6 (see col. 5, lines 35-36).

Makimoto teaches the collect layer 106 is a p-type InGaN, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine teaching of Makimoto and Bakowski to form a sub-layer in the collector layer which contains indium containing p-type nitride semiconductor layer as material of the collector layer so that the indium containing p-type nitride semiconductor layer can be act as the energy barrier for the nitride semiconductor device.

Regarding **claim 82**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches said indium-containing p-type nitride semiconductor layer (refer to the upper portion of 106) is p-type InGaN.

Regarding **claim 85** Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Furthermore, fig. 10 of Makimoto shows a graded layer (105) between said p-type base layer (refer to the lower portion of 106) and n-type collector layer (104).

Regarding **claim 86**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer (refer to the upper half portion of 106) has a thickness of between 1 and 1000nm (NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Regarding **claim 87**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer has a thickness of between 1 and 100nm NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Regarding **claim 88**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer (refer to the upper portion of 106) has a thickness

of between 1 and 1000nm (NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Regarding **claim 89**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer (refer to the upper half portion of 106) has a thickness of between 1 and 100nm (NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Claims 54, 57, 59, 60, 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Makimoto, in view of K. Kumakura, T. Makimoto and N. Kobayashi, Low-Resistance Nonalloyed Ohmic Contact to p-type GaN Using Strained InGaN Contact Layer, Applied Physics Letters, Vol. 79, No. 16, pp 2588-2590 (2001).

Regarding **claim 54**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above except for said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGaN base layer.

Kumakura et al. exhibits that the contact resistance decreased with increase In mole fraction of p-type InGaN contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumrakura in the nitride

semiconductor device structure of Makimoto in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Makimoto and Kumakura teaches said p-type nitride semiconductor layer (according to Kumakura, the InGa_N layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer (according to Makimoto, the indium mole fraction of p-InGa_N base is 6% as shown in fig. 10).

Regarding **claim 57**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above except for said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer.

Kumakura exhibits that the contact resistance decreased with increase In mole fraction of p-type InGa_N contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumakura in the nitride semiconductor device structure of Makimoto in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Makimoto and Kumakura teaches said p-type nitride semiconductor layer (according to Kumakura, the InGa_N layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer (according to Makimoto, the indium mole fraction of p-InGa_N base is 6% as shown in fig. 10).

Regarding **claim 59**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above except for said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGaN base layer.

Kumakura exhibits that the contact resistance decreased with increase In mole fraction of p-type InGaN contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumakura in the nitride semiconductor device structure of Makimoto in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Makimoto and Kumakura teaches said p-type nitride semiconductor layer (according to Kumakura, the InGaN layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an indium mole fraction of said p-type InGaN base layer (according to Makimoto, the indium mole fraction of p-InGaN base is 6% as shown in fig. 10).

Regarding **claim 60**, Makimoto and Bakowski disclose all the limitations of the claimed invention for the same reasons as set-forth above except for said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGaN base layer.

Kumakura exhibits that the contact resistance decreased with increase In mole fraction of p-type InGaN contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Therefore, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumrakura in the nitride semiconductor device structure of Makimoto in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Makimoto and Kumakura teaches said p-type nitride semiconductor layer (according to Kumakura, the InGa_N layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer (according to Makimoto, the indium mole fraction of p-InGa_N base is 6% as shown in fig. 10).

Regarding **claim 84**, Makimoto discloses all the limitations of the claimed invention for the same reasons as set-forth above except for said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer.

Kumakura exhibits that the contact resistance decreased with increase In mole fraction of p-type InGa_N contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Therefore, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumrakura in the nitride semiconductor device structure of Makimoto in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Makimoto and Kumakura teaches said p-type nitride semiconductor layer (according to Kumakura, the InGa_N layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an

indium mole fraction of said p-type InGaN base layer (according to Makimoto, the indium mole fraction of p-InGaN base is 6% as shown in fig. 10).

Claims 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Makimoto, in view of Bakowski, and further in view of K. Kumakura, T. Makimoto and N. Kobayashi, Low-Resistance Nonalloyed Ohmic Contact to p-type GaN Using Strained InGaN Contact Layer, Applied Physics Letters, Vol. 79, No. 16, pp 2588-2590 (2001).

Regarding **claim 90**, Makimoto disclose a nitride semiconductor structure (fig. 10) comprising on a substrate (item 101):

an n-type collector layer (item 104);

a p-type base layer (refer to the lower half portion of 106) formed over said n-type collector layer (104), wherein said p-type base layer (106) is p-type InGaN;

an n-type emitter layer (107) formed directly on said p-type base layer (refer to the lower half portion of 106),

Makimoto fails to teach an indium-containing p-type nitride semiconductor layer formed directly on said p-type base layer so as to contact a top surface of said p-type base layer, wherein said indium-containing p-type nitride semiconductor layer does not contact said n-type emitter layer; and a base electrode regrown on the top surface; and a base electrode formed over said indium-containing p-type nitride semiconductor layer.

Fig. 3 of Bakowski shows a similar nitride semiconductor comprising: a p-type contact layer (11) formed directly on the p-type base layer (6) so as to contact a top

surface of said p-type base layer (6), wherein said p-type contact layer (11) does not contact said n-type emitter layer (2); and a base electrode (5) formed over said p-type nitride semiconductor layer (11).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine Bakowski in the teaching of Makimoto so that the contact layer can act as an energy barrier for the electrons and diverting them towards the collector, which helps to obtain a low collect-emitter voltage in the on-state of the device (see Bakowski: col. 5, lines 50-52).

Although the Bakowski's contact layer 11 does not contain indium, the p-type contact layer 11 of Bakowski is made of the same material as the collector layer 6 (see col. 5, lines 35-36).

Makimoto teaches the collect layer 106 is a p-type InGa_N, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teaching of Makimoto and Bakowski to have an indium containing p-type nitride semiconductor layer since the indium containing p-type nitride semiconductor layer can be act as the energy barrier, which helps to obtain a low collector-emitter voltage in the on-state of the nitride semiconductor device.

Makimoto and Bakowski fail to teach said p-type nitride semiconductor layer has an indium mole fraction higher than an indium mole fraction of said p-type InGa_N base layer.

Kumakura et al. exhibits that the contact resistance decreased with increase In mole fraction of p-type InGa_N contact up to 0.19 (see p. 2589, col. 1, paragraph 1).

Thereof, it would have been obvious to one having ordinary skills in the art at the time the invention was made to combine the teaching of Kumakura in the nitride semiconductor device structure of Makimoto and Bakowski in order to reduce the contact resistance (see p. 2589, col. 1, paragraph 1).

The combination of Kumakura, Makimoto and Bakowski teaches said p-type nitride semiconductor layer (according to Kumakura, the InGaN layer having In mole fraction from 0.14-0.23 as recited in col.2, line 12) has an indium mole fraction higher than an indium mole fraction of said p-type InGaN base layer (according to Makimoto, the indium mole fraction of p-InGaN base is 6% as shown in fig. 10).

Regarding **claim 91**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth. Besides, the Bakowski's contact layer 11 does not contain indium, the p-type contact layer 11 of Bakowski is made of the same material as the collector layer 6 (see col. 5, lines 35-36).

Makimoto teaches the collect layer 106 is a p-type InGaN; thereof, it would be obvious to use the same material InGaN of the collect layer to be the material of contact layer so that it would reduce the cost of making product.

Regarding **claim 92**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teach said p-type InGaN base layer has an indium mole fraction of 5-30% (see fig. 10 exhibits the p-type InGaN base containing 6% of Indium).

Regarding **claim 93**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides,

Makimoto teach said p-type InGaN base layer has an indium mole fraction of 5-30% (see fig. 10 exhibits the p-type InGaN base containing 6% of Indium).

Regarding **claim 94**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth above. Furthermore, Fig. 10 of Makimoto shows a graded layer (105) between the p-type base layer (106) and the n-type collection layer (item 104); wherein the graded layer (105) has its indium mole fraction varied gradually (see par.[0009],lines 1-3).

Regarding **claim 95**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set forth above. Furthermore, Fig. 10 of Makimoto shows a graded layer (105) between the p-type base layer (106) and the n-type collection layer (item 104); wherein the graded layer (106) has its indium mole fraction varied gradually (see par.[0009],lines 1-3).

Regarding **claim 96**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set forth above. Besides, fig. 3 of Bakowski and fig. 10 of Makimoto show the base electrode (5 in fig. 3 of Bakowski) is formed directly on said indium-containing p-type nitride semiconductor layer (refer to Makimoto's material).

Regarding **claim 97**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer (refer to the upper half portion of 106) has a thickness of between 1 and 1000nm (NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Regarding **claim 98**, Makimoto, Bakowski and Kumakura disclose all the limitations of the claimed invention for the same reasons as set-forth above. Besides, Makimoto teaches the p-type nitride semiconductor layer has a thickness of between 1 and 100nm NOTE: fig. 10 exhibits that the thickness of 106 is 100nm; thereof, half of the thickness 106 is 50 nm).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tram Hoang Nguyen whose telephone number is (571) 272-5526. The examiner can normally be reached on 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on (703)872-9306. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/516,380

Page 18

Art Unit: 2818

THN

Art Unit 2818

/DAO H NGUYEN/

Primary Examiner, Art Unit 2818

October 26, 2008